

instructions could be materially improved. The anatomical facts are clearly stated considering that this part of the subject is much more advanced than the rest of the book. But speaking generally, the author has aimed at brevity, and in so doing has sacrificed exactness; this is specially noticeable in the course of external morphology, where several mistakes and incomplete definitions occur.

The short introduction to elementary botany planned by Miss Laurie is a direct antithesis to the last, as the facts recorded are few, but they are deduced or suggested so as to arouse interest and stimulate experiment and thought. Written primarily for quite small children, it shows how facts in the life-history of plants may be taught from simple experiments, such as the growth of mustard seeds in a bottle. In addition to morphology and the accompanying physiology, there are chapters on interrelation between plants and animals, climbing plants and colours of plants. Although the information is couched in a form understandable by young children, the book could be advantageously adopted as a first course for older children, and might be profitably consulted by many teachers as a guide to imparting instruction.

The observation of trees and shrubs is preeminently suited for a nature-study class, and possesses the advantage that there is much to be noted even during the winter months. A short, concise manual or primer at a modest price is an existing desideratum. The volume written by Mr. Coleman compasses the subject and certainly sells at a modest price, but it fails to satisfy the want alluded to. The author has culled much interesting information of a general and historic nature, but there is an almost entire absence of the numerous botanical features of interest, such as winter buds, arrangement of leaves, &c., and for identification the reader is mainly dependent upon the illustrations. The notes on animals and insects haunting the various trees and shrubs are so useful that one wishes the author had given more space to these facts of natural history. A list of British lepidopterous insects the caterpillars of which feed on certain plants is provided in an appendix.

APPLIED MATHEMATICS.

- (1) *Computation and Mensuration*. By P. A. Lambert. Pp. ix+92. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1907.) Price 3s. 6d. net.
- (2) *A First Statics*. By C. S. Jackson and R. M. Milne. Pp. viii+380. (London: J. M. Dent and Co., 1907.) Price 4s. net.
- (3) *Practical Calculations for Engineers*. By C. E. Larard and H. A. Golding. Pp. xiii+455. (London: C. Griffin and Co., Ltd., 1907.) Price 6s. net.

(1) THE author says that the boys in the secondary schools of America are not taught to apply their mathematics independently, and consequently find, on entering college, that they have difficulty in

making effective use of their theoretical knowledge, and this book is intended as a link between the school and college courses, to be studied either at the end of one or the beginning of the other.

The same deficiency is manifest in boys leaving our schools, and in this country is being met by improved teaching combined with practical work in the laboratory, as a regular part of the school course.

The book is admirably planned and written, is concise, neat in method and interesting, and meets a real want in a worthy manner. It begins with examples of direct measurement, approximate numbers, and contracted arithmetic, estimating the degree of accuracy by the number of decimal places; perhaps the number of significant figures would have been better. This is succeeded by examples of practical geometry, including the construction and measurement of triangles, and some squared-paper work. Then follows the volume of a prismatoid, and in later chapters on mensuration it is shown that the prismoidal formula, or Simpson's rule, is widely applicable. There is a useful chapter on trigonometrical computation, introducing very appropriately the notion of a vector with examples of vector summation. Logarithms and the slide rules are next considered, followed by an interesting chapter on limits, illustrated by several important convergent series. The author always seizes on the salient points, is never prolix, and the interest never flags; in each chapter the student is well started on his way, then provided with good and suggestive examples, and wisely left to his own resources. Thus, although the pages of the book are comparatively few, the usual ground is covered, and a thorough and efficient training in practical computation is provided. English teachers would do well to consult this work.

(2) This text-book proceeds on easy lines, and the student is provided with a wealth of examples at every stage from which to choose, the answers being collected at the end of the volume. In their scheme the authors have considered "the historical order of development of the subject, as indicating almost infallibly the line of least resistance." Thus in the first chapter the principle of the lever is introduced, and the law of moments for parallel forces is established by simple experiments, then illustrated by examples of ancient and modern steelyards and balances, and finally applied to find the conditions of equilibrium of three parallel forces in a plane. The next two chapters deal with the parallelogram law for forces at a point, the treatment being here again, as always, experimental, graphical, and analytical, with examples of useful applications in the arts. It is not quite clear why the authors should substitute the term "geometric" addition for *vector* addition, or why arrow-heads should "sometimes" instead of *always* be inserted in vector diagrams. In chapter iv. the principle of moments is again considered, being now deduced from that of the parallelogram and applied to couples. Then follow sections dealing with machines, friction, and centres of

gravity, the latter being somewhat extensively applied, including Guldinus's rules and mensuration problems. The concluding chapters relate to forces and jointed frames in two and three dimensions, with examples of roof and bridge trusses and cranes.

The general plan of the book is good, the endeavour being to "lay stress on the practical utility of the science" rather than on "rigour of deduction." In carrying out this very laudable idea, the authors, through lack of practical experience, sometimes err by giving drawings like that of the safety-valve on p. 242, in which the constructional details are almost offensively crude, or by giving examples like No. 16, p. 140, where the efficiency of a Weston differential pulley-block is stated to be 80 *per cent.*, or like No. 38, p. 77, in which a rail, supported at the ends and loaded as a beam at the middle, is said to be bent into a *circular arc*. In spite of these minor defects, however, the book can be recommended as affording an excellent introduction to statics.

(3) The general character of this work places it somewhere between the engineering pocket-book and the college text-book. The methods, formulæ, and appliances which a student encounters during a good college course in mechanical engineering are here, not demonstrated, but collected and described, systematically, and applied to such practical examples as are likely to occur in an engineering workshop. In section i. the subject-matter comprises arithmetical, graphical, and mechanical computations, by modern abbreviated methods, and includes technical mensuration, the use of the slide-rule and the planimeter, and mathematical tables. In section ii. we have laboratory experiments and calculations relating to machines, acceleration, momentum, force, work, energy, and power. Section iii. relates to boilers and heat engines, considered both from the thermodynamical and constructional point of view, with a chapter on the cost of motive power. These three sections are well adapted for students who have passed from college to practical work, in helping them to recall their theoretical knowledge as occasion may require. A good collection of examples will be found for practice. The style is perhaps somewhat diffuse, and there are a few minor defects, but this portion of the book will be appreciated in many quarters.

The fourth and concluding section, however, is of most interest and value. It deals with the business side of engineering, a branch that is beyond the usual college course, yet of paramount importance to the young aspiring engineer. The subjects discussed are the commercial aspects of engineering; the qualifications and duties of the works manager; the calculation of weights and the preparation of estimates and bills of costs; and the bonus and premium systems of wages. The authors give some most striking examples of the great value of squared-paper work in the systematic plotting of variable quantities in all branches of a manufacturing establishment, and the lessons to be learnt therefrom. This section is extremely suggestive, and will well repay the careful study of all practical engineers.

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MULTUM IN PARVO.

- (1) *Die Tierwelt des Mikroskops (die Urtiere)*. By Dr. Richard Goldschmidt. Pp. iv+100; 39 figures. (Leipzig: B. G. Teubner, 1907.) Price 1.25 marks.
- (2) *Das Süsswasser-Plankton*. By Dr. Otto Zacharias. Pp. iv+130; 49 figures. (Leipzig: B. G. Teubner, 1907.) Price 1.25 marks.
- (3) *Befruchtung und Vererbung im Pflanzenreiche*. By Prof. K. Giesenhagen. Pp. iv+132; 31 figures. (Leipzig: Quelle and Meyer, 1907.) Price 1.25 marks.
- (4) *Das Werden und Vergehen der Pflanzen*. By Prof. P. Gisevius. Pp. 132; 24 figures. (Leipzig: B. G. Teubner, 1907.) Price 1.25 marks.
- (5) *Das Schmarotzertum im Tierreich und seine Bedeutung für die Artbildung*. By Prof. Ludwig von Graff. Pp. iv+132; 24 figures. (Leipzig: Quelle and Meyer, 1907.) Price 1.25 marks.
- (6) *Die Mechanik des Geisteslebens*. By Prof. Max Verworn. Pp. iv+104; 11 figures. (Leipzig: B. G. Teubner, 1907.) Price 1.25 marks.

IT was Leibniz who said that the more science advances the more it will be expressed in little books. If that is so, the recent abundant crop of primers may be regarded as a healthy sign—especially when we find that many of them are very good. It need hardly be said that an introduction to the study of parasitism by von Graff, or to the study of fresh-water plankton by Zacharias, cannot fail to be useful and stimulating. There is also an economic side to the phenomenon presented by the bundle of primers before us. It seems as if the great encyclopædias, which were relatively costly, were being replaced by these cheap booklets. Instead of saving up to purchase the huge volume P, containing much that he does not want, the student can buy at a shilling each three little treatises on parasitism, plankton, and protozoa. This expresses a democratisation of scientific literature, with its familiar analogue in the popular "sixpennies."

(1) In a clear and precise way, Dr. Richard Goldschmidt tells the story of the Protozoa—how they came to be known, where they are found, how they live, what part many of them play in the economy of the sea, what they have done in building up chalk cliffs and the like, and how they come into close quarters with man in malaria and sleeping sickness, and other diseases. With the aid of excellent figures, most of which are familiar, and some of which, like Max Schulze's *Polystomella*, could hardly be improved upon, the author introduces the student to the rhizopods, the infusorians and Sporozoa, and although the book will not, of course, enable the observer to identify many of the Protozoa which he may discover, it will help him to understand them and to realise how many problems even the common amœba still raises in a reflective mind.

(2) The indefatigable director of the biological station at Plön deals with a subject to the study of which a great part of his life has been honourably devoted—the fresh-water plankton. His treatment of